Measurement

Reliability

Measurement Steps

Conceptualization

Nominal Definition

Operational Definition

Measurements in the Real World

Criteria for measurement quality

Precision*

Accuracy*

Reliability

Validity**

*obvious

**previously

Main Entry: **re·li·abil·i·ty**

Pronunciation: \ri-ˌlī-ə-ˈbi-lə-tē\

Function: *noun* Date: 1816

1 : the quality or state of being **reliable**

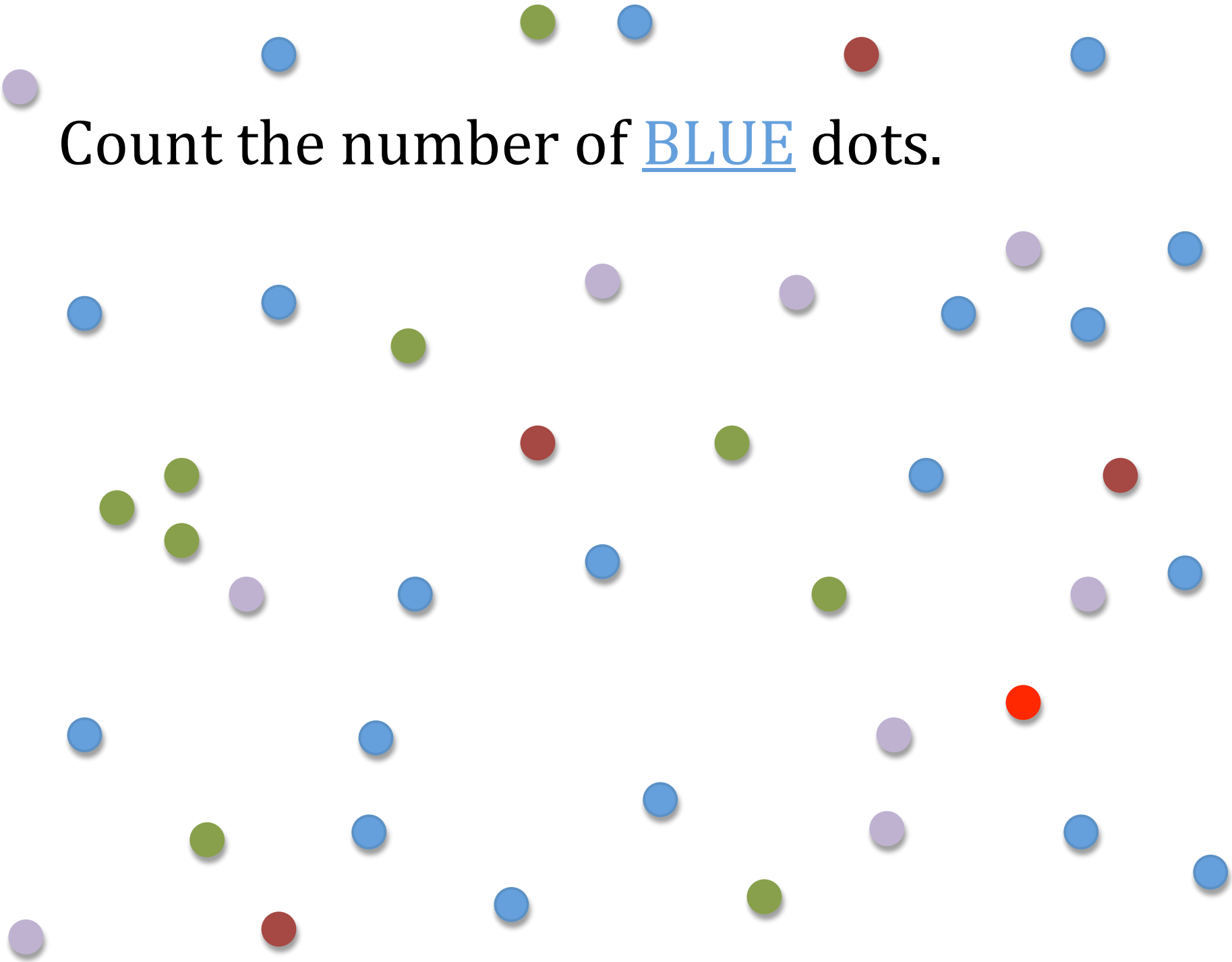
2 : the extent to which an experiment, test, or measuring procedure yields the same results on repeated trials

Reliability

that quality of measurement method that suggests that the same data would have been collected each time in *repeated observations* of the same phenomenon.

Repeatability | Consistency

Count the number of BLUE dots.



Measure
the Class' Attitude
Toward the Brand:
Southwest Airlines

Southwest Airlines is:

bad	1	2	3	4	5	6	7	good
dislike quite a lot	1	2	3	4	5	6	7	like quite a lot
unpleasant	1	2	3	4	5	6	7	pleasant
poor quality	1	2	3	4	5	6	7	good quality

Your “Attitude Toward Southwest Airlines” score should be a number from 4 to 28.

True Score Theory

$$X = T + e_x$$

Observed score = True score + error

$$var(X) = var(T) + var(e_x)$$

True Score Theory

$$X = T + e_x$$

- Most measurement has error
- If measure has no error, it is perfectly reliable.
- If measure has no true score, it has zero reliability.

Measurement error

$$X = T + e_x$$

$$e_x = e_r + e_s$$

Random error (e_r) randomly affects measurement of a variable across a sample (noise).

Measurement error

$$X = T + e_x$$

$$e_x = e_r + e_s$$

Systematic error (e_s) systematically affects measurement (bias).

Reducing Measuring Error

- Test, test, test
- Training
- Double-check data
- Statistics
- Multiple measures (triangulation)

Theory of Reliability

Measure variable X two times.

$$X_1 = T + e_1$$

$$X_2 = T + e_2$$

If the measure is *reliable*, scores will be pretty much the same.

Reliability is a ratio.

True Score / Measure

Variance of True Score / Variance of Measure

var(T) / var(X)

Reliability Ratio = var(T) / var(X)

&

$var(X) = var(T) + var(e_x)$

therefore

Reliability Ratio =

$$\frac{var(T)}{var(T) + var(e_x)}$$

We cannot compute actual reliability!

$$\frac{\text{var}(T)}{\text{var}(T) + \text{var}(e_x)}$$

We can only ***estimate*** it.

0.0 – 1.0

The value of a reliability estimate tells us the proportion of variability in the measure attributable to the true score.

Four Types of Reliability

Inter-Rater / Inter-Observer Reliability

(Intercoder Reliability)

Assess the degree to which different raters/observers give consistent estimates of the same phenomenon.

% agreement

Test-Retest Reliability

Assess the consistency of a measure from one time to another.

Observations are related over time.

Parallel-Forms Reliability

Assess the consistency of the results of two tests constructed in the same way from the same content domain.

Internal Consistency Reliability

Assess the consistency of results across items within a test.

Average inter-item correlation

Average itemtotal correlation

Split-half reliability

Chronbach's alpha

Reliability & Validity